126,766

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in Electric Cells or Batteries.

We, Prof. Dr. EMIL BAUR, of Ottikerstrasse 53, Zurich, Switzerland, and Dr. WILLIAM DUPRÉ TREADWELL, of Freudenbergstrasse 146, Zurich, Switzerland, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In order to obtain electrical energy by the consumption or combustion of carbon, hydrogen, carbonic oxide and carburetted hydrogen together with the oxygen of the air in galvanic elements, or so-called "combustible-cells", from the chemical energy of the corresponding reactions, as for instance $C + O = CO$; $C + O_2 = CO_2$; $2H_2 + O_2 = 2H_2O$; $2CO + O_2 = 2CO_2$, it has already been proposed to combine combustible-elements for work at high temperature in the following form:

Combustible electrode	fused salt	diaphragm	fused salt	air electrode.

In Specification No. 2272 of 1897, of J. L. Dobell, and in Specification No. 15,903 of 1897, of A. D. Seton and J. L. Dobell the under mentioned combination is, for instance, described.

Lead	lead oxide	diaphragm of magnesia	caustic soda with manganate	iron.

The electrodes, are molten, the lead electrode is depolarized by carbon or combustible gases and the iron electrode is depolarized by means of air.

Quite similar is the combination, described in the British Specification No. 8906 of 1896 of L. B. Atkinson and F. G. Treharne:

Lead	lead oxide	diaphragm of magnesia	lead oxide copper oxide	copper

The lead-electrode being depolarised by combustibles and the copper-electrode by air.

Attention may furthermore be directed to the combinations described by E. Baur and H. Ehrenberg in Zeitschrift für Elektrochemie 18, 100 (1912) for example:

Carbon	soda	diaphragm of magnesia	soda	silver

[*Price 6d.*]

In place of the carbon electrode an electrode of iron or nickel with a combustible gas can be used. The silver electrode is depolarized by air.

These latter elements or cells, as with those to be described later, yield at 900° to 1000° a "reversible" electromotive power of, in round figures, 1 volt, whilst the elements or cells according to Dobell and L. B. Atkinson with molten lead and oxide of lead only give in round figures ½ volt. The continuous operation of these combustible-cells, however, is opposed by the slagging action of the fused salts. In order to remain permanently efficient, the electrodes must be kept dry. But if the salt fusion and the diaphragm be replaced by solid electrolyte, then the internal resistance of the combustible element becomes too high.

Now the object of the present invention is to overcome this difficulty. For this purpose one or more refractory diaphragms saturated with molten salts bears or bear directly along or against the whole effective surface of not only the one but also the other electrode and these electrodes remain in a dry state. In this way the diaphragm or diaphragms effects or effect with the electrodes an electrolytic contact, sufficient for good conductivity which moreover does not chemically attack in a prejudicial manner the almost dry electromotively acting masses at the electrodes.

In a combustible cell for generating electric energy according to the invention the intermediate space between the combustible electrode and the air electrode may, for example, be filled with a diaphragm or diaphragms saturated with molten salt. This refractory diaphragm or these refractory diaphragms may be either a porous rigid body or bodies or a non-rigid fabric or packing or plugging material.

A combustible cell made in this way will, consequently have the form:

Combustible electrode	diaphragm saturated with salt	air electrode

In the drawing are illustrated by way of example diagrammatically two embodiments of the said invention.

Fig. 1 shows a first embodiment and

Fig. 2 the second one.

In Fig. 1 an iron receiver 1 is charged to a suitable depth with broken coke 2 as combustible electrode. Upon the coke lies as a diaphragm a plate of burnt magnesia 3 saturated with melted soda and upon such plate is an air electrode consisting of iron wire gauze 4 over which is spread a coating mass 5 of hammer slag, forge scales or iron oxide surmounted by a gas bell of fire-proof material 6 with a supply pipe 7 and a pipe 8 for discharging air. The cell is placed in a heating chamber at a suitable temperature, for instance 900°.

In Fig. 2 an iron receiver 9 is charged with a molten salt, for example melted soda 10, into which dip two magnesia pipes 11 closed at the bottom. These pipes become saturated with the molten salt and form refractory diaphragms. Each magnesia pipe 11 is partly lined inside with iron wire gauze 12, the remaining hollow space being occupied in each case by a gas supply pipe 13. Through one of the gas supply pipes 13 air is blown in, the wire gauze lining said pipe being thereby brought into the proper or required condition owing to self oxydation, thus building up the electrode which is depolarised by air. Through the other gas supply pipe 13 an inflammable gas such as hydrogen, carbonic oxide, water gas or lighting gas is blown in thus forming the combustible electrode. The cell is placed in a heating chamber at a suitable temperature, say 900° for example. In the construction shown in this figure the diaphragms 11 bear directly along or against the iron wire gauze linings 12, the latter being the whole effective surface of not only the one but also the other electrode. The electrodes coming only in contact with the diaphragms saturated with molten salt and not with the molten salt itself, remain in a dry state.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

A combustible element or cell for generating electrical energy comprising a combustible electrode and an electrode which is depolarized by air, both electrodes being in contact with a refractory diaphragm or refractory diaphragms saturated with molten salt, the contact between the electrodes and diaphragm or diaphragms extending along the whole effective surface of the electrodes, these electrodes remaining in a dry state.

Dated this 16th day of March, 1918.

For the Applicants,
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10, New Court, Lincoln's Inn, London, W.C.2,
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[This Drawing is a full-size reproduction of the Original.]

Fig. 1

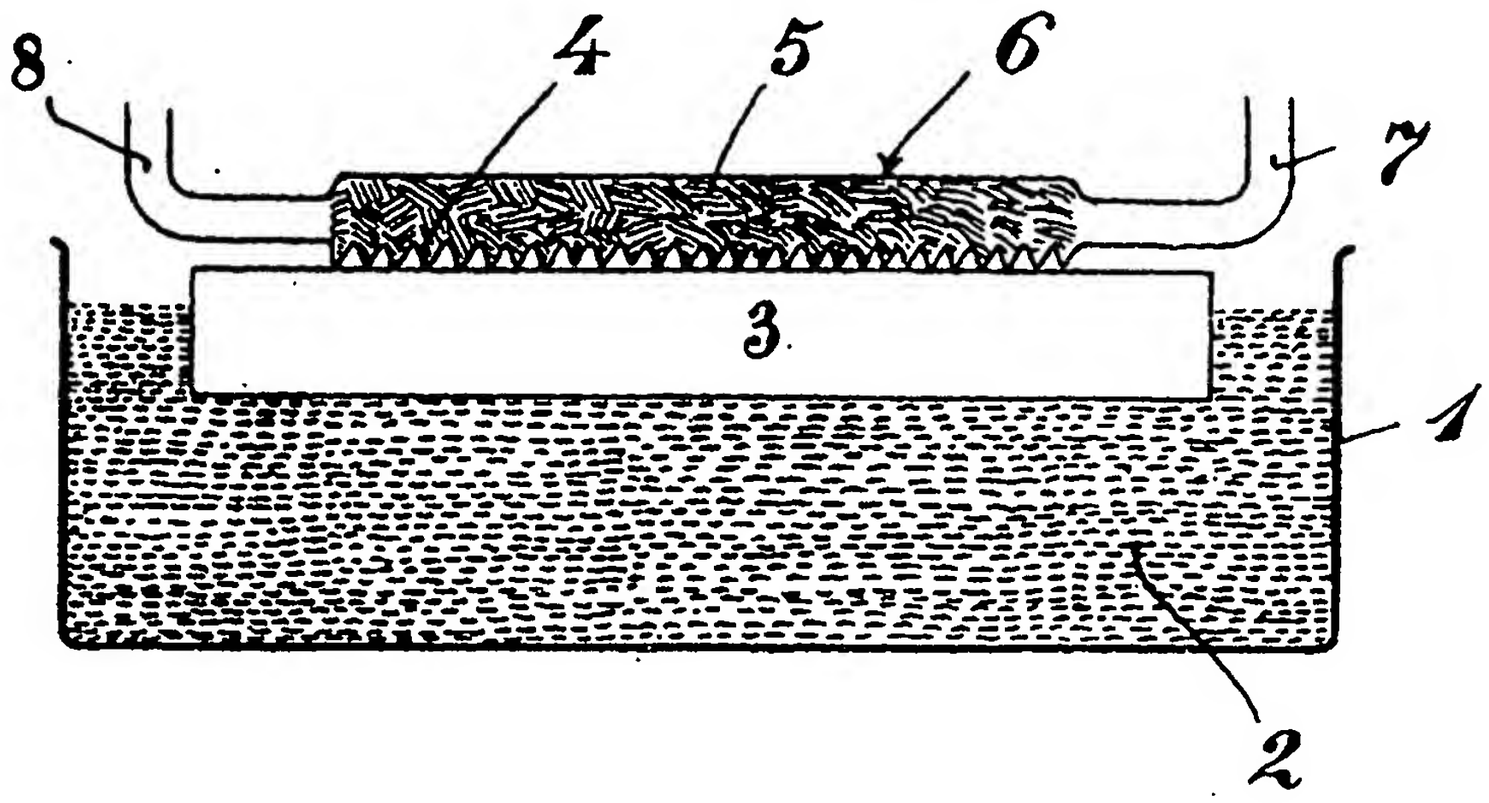
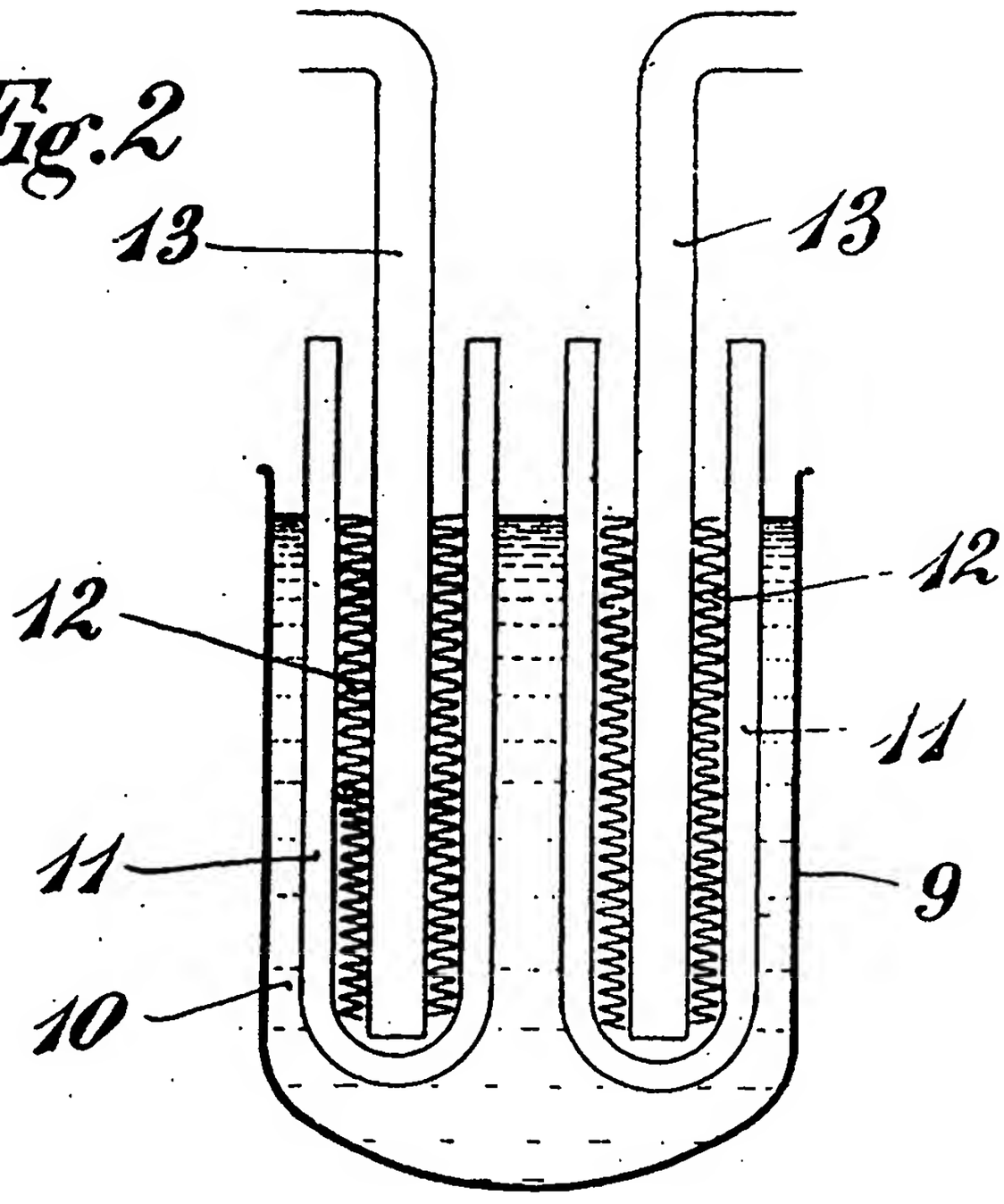


Fig. 2



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